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Short Communication

A scientometric study on research trends and characteristics of mucoepidermoid carcinoma of salivary glands

Xiuyin Wu [a,b], Yawen Ji [c], Ke Bi [b], Zhen Wang [b], Meili Sun [a*]

[a] *Department of Oncology, Central Hospital Affiliated to Shandong First Medical University, Shandong, China*
[b] *Department of Stomatology, People's Hospital Affiliated to Shandong First Medical University, Shandong, China*
[c] *Department of Stomatology, Central Hospital Affiliated to Shandong First Medical University, Shandong, China*

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Therapy strategy

Abstract *Background/purpose:* Mucoepidermoid carcinoma (MEC) is the most common malignant tumor of the salivary glands. The purpose of this study was to analyze the scientometric characteristics and research trends of salivary MEC.
Materials and methods: All the papers on salivary MEC were comprehensively retrieved from the Scopus database. The years of publication were divided into before 2014 and Jan 2014–Jun 2025 in the analysis of research trends.
Results: There were 1308 papers on salivary MEC, with total citations of 24,598 and the *h* index of 70. The most frequent location of MEC involved was parotid gland, followed by minor saliva gland and submandibular gland. The keywords of differential diagnosis included adenosquamous carcinoma, pleomorphic adenoma, squamous cell carcinoma, Warthin tumor, and adenoid cystic carcinoma. Cancer surgery, radiotherapy, parotidectomy, neck dissection, chemotherapy, and cisplatin were the keywords of treatment. The research trend of has changed to cohort analysis, cancer prognosis, diagnostic imaging, positron emission tomography-computed tomography (PET-CT), perineural invasion, p63, gene mutation, gene rearrangement, and gene translocation after 2014. There have always been the common keywords such as pathology, tumor marker, immunohistochemistry, Ki-67, CRTC1, MAML2, gene fusion, and fluorescence in situ hybridization (FISH).
Conclusion: This study for the first time elucidated the current scenario and scientometric characteristics of MEC, and would help in improving in reciprocal collaboration and provide helpful guidance for further research.

* Corresponding author. Department of Oncology, Central Hospital Affliated to Shandong First Medical University, 105 Jiefang Road, Jinan, Shandong 250013, China.
E-mail address: smli1980@163.com (M. Sun).

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Introduction

Mucoepidermoid carcinoma (MEC), as the most common malignant tumor of the salivary glands, is characterized by a mixture of mucous cells and an epidermoid component.[1,2] MEC most frequently occurs in the major salivary glands, mainly the parotid gland, followed by the minor salivary glands in the oral cavity, and it also occurs in the lung and other sites.[1,2] The histologic subtypes of MEC are often divided into seven categories: classic, Warthin-like, sclerosing, oncocytic, papillary, clear cell, and solid.[3] The histopathologic degrees of this malignancy are classified into low-grade, intermediate, and high-grade.[3,4] The main treatment approach for MEC is surgical resection, combined with adjuvant radiotherapy and chemotherapy, which are indicated for metastatic carcinoma.[3,4] The etiology and pathogenesis of MEC remain poorly understood, and the treatment options, especially the high-grade MEC, often prove unsatisfactory.[4]

Despite numerous studies regarding the field of MEC conducted thus far, gaps remain in its etiopathogenesis and treatment challenge clinical practice. Scientometrics is a useful tool that utilizes citation and bibliometric data to measure scientific output and research trend of a specific research field.[5,6] Conducting a scientometric analysis is imperative to elucidate the foundational structure and emerging hotspots of MEC research. A scientometric study on adenoid cystic carcinoma of salivary glands was recently reported,[7] but there was no relevant study on MEC. To develop a better comprehensive understanding of the pathogenesis and management strategies of the most common malignant tumor of the salivary glands, the current study thus aimed to analyze the scientometric characteristics and research trends of salivary MEC with emphasis on chronological comparison of the keywords, so as to provide helpful guidance for further research.

Materials and methods

As per the methodology described previously,[5–7] all the papers on salivary MEC in the Scopus database were retrieved on 30 Jun 2025. We used medical subject terms "mucoepidermoid carcinoma" in the title and "saliva OR gland OR head OR oral" in the title/abstract/keyword in literature search, without restriction to paper type and year of publication. Only English literature was included because it is an international knowledge-exchange language. The scientometric characteristics of all the eligible papers were recorded for the following information: title, keyword, citation count, publication year, journal of publication, authorship, affiliation, and country/region of origin. Data search and extraction were performed independently by two investigators, and any discrepancy of results was resolved in a consensus symposium. The years of publication were divided into before 2014 and Jan 2014—Jun 2025, so that the number of papers can be to some extent compared in the analysis of research trends. Microsoft Office Excel 365 was used for index model building, and the Bibliometrix Biblioshiny R-package software was used for bibliometric statistics. In this descriptive study, variables were presented as numbers and percentages. No comparisons were made, and thus no *P*-values were set.

Results

Citation characteristics

With the search strategy algorithm, a total of 1308 English papers on salivary MEC were retrieved in the Scopus database. As presented in Fig. 1A, the most type of papers on MEC was article (n = 1158), followed by review (n = 66) and letter (n = 50). The total citation count (after removal of self-citations) was 24,598 (22,977) and the *h* index was 70 (67) for all the papers. To further concretize the trends of scientific output, we assessed the annual number and accumulated citations of the papers during 2005—2024 (Fig. 1B). The annual number of the papers on MEC changed between 21 and 71 during 2005—2024. The accumulated citations (after removal of self-citations) of the papers increased from 342 (320) to 1722 (1607) during 2005—2024. The detailed information on publication year, authors, title, abstract, journal of publication, citation count, institutions, keywords, and paper type of the 100 most-cited papers are presented in supplementary Table S1.

Bibliometric characteristics

Fig. 1C displays cloud graphs of journals of publications, contributing authors, institutions, and countries/regions of origin of the papers on salivary MEC, which were divided into before 2014 (657 papers) and Jan 2014—Jun 2025 (651 papers), so that the number of papers can be to some extent compared in the analysis. Before 2014, the journal of publication, contributing author, institution and country of origin with largest number of papers was *Cancer* (26 papers), El-Naggar, A.K. and Kowalski, L.P. (both 13 papers), University of Texas MD Anderson Cancer Center (25 papers) and United States (235 papers), respectively. After 2014, the journal of publication, contributing author, institution and country of origin with maximum number was *Oral Oncology* (18 papers), Bishop, J.A. (9 papers), Universidade de São Paulo and University of Michigan Ann Arbor (both 13 papers) and United States (169 papers),

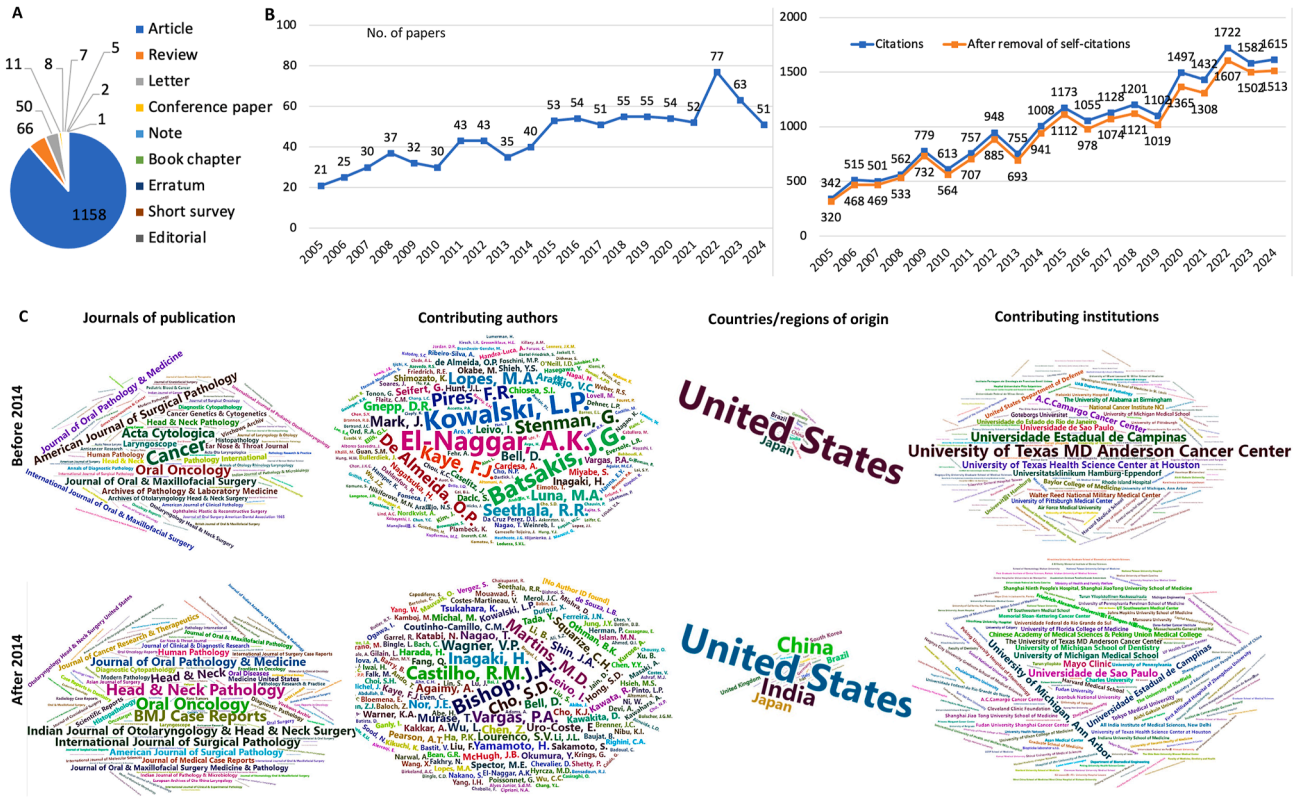

Figure 1 Bibliometric characteristics of the papers on salivary mucoepidermoid carcinoma (MEC). (**A**) The numbers of different paper types. (**B**) The annual number and accumulated citations of the papers during 2005–2024. (**C**) Cloud graphs of journal of publication, contributing authors, countries and institutions of origin regarding MEC papers before 2014 and Jan 2014–Jun 2025. The font size indicates the number of papers; a larger size means more papers in the cloud graphs.

respectively. Table S2 presents the journals, contributing authors, institutions, and countries/regions with largest number of papers (rank, 1–10).

Research characteristics

Based on the frequency of the keywords in all the papers on MEC (Fig. 2A), a list of the common keywords is automatically recognized by the database. The most keyword of study design was controlled study, followed by retrospective study and follow-up study. The most keyword of the gland of MEC involved was parotid gland, followed by minor saliva gland and submandibular gland. The keywords of differential diagnosis included adenosquamous carcinoma, parotid neoplasms, pleomorphic adenoma, squamous cell carcinoma, Warthin tumor, and adenoid cystic carcinoma (Fig. 2B). Cancer surgery, radiotherapy, parotidectomy, neck dissection, chemotherapy, and cisplatin were the keywords of treatment. Before 2014 and during Jan 2014–Jun 2025, there have always been the same common keywords such as pathology, immunohistochemistry, tumor marker, differential diagnosis, parotid gland tumor, lymph node metastasis, metabolism, Ki-67, CRTC1, MAML2, gene fusion, and fluorescence in situ hybridization (FISH).

Based on the keywords of papers on MEC published in different years (Fig. 2C), the more common keywords can basically reflect research trends. Before 2014, the keywords, such as adenolymphoma, aspiration biopsy, cancer classification, cancer invasion, cancer localization, cancer mortality, carcinoembryonic antigen, cisplatin, combined modality therapy, mandibular neoplasms, palatal neoplasms, electron microscopy, and ultrastructure, were more frequent. After 2014, the keywords of clinical aspect such as cohort analysis, clinical outcome, outcome assessment, cancer prognosis, distant metastasis, disease specific survival, diagnostic imaging, positron emission tomography-computed tomography (PET-CT), echography, perineural invasion, lymphadenopathy, bronchoscopy, fine needle aspiration biopsy, and antineoplastic agent were more frequent. The keywords of laboratory investigation, such as genetics, gene mutation, gene rearrangement, gene translocation, protein p63, transactivator protein, in vitro study, and tumor cell line, were more common.

Discussion

MEC predominantly originates in the salivary glands, accounting for approximately 10 % of all salivary gland tumors and approximately 30 % of salivary gland malignant tumors.[1,2] We identified the keywords of MEC involving locations, differential diagnosis, treatment modalities, and common keywords such as pathology, immunohistochemistry, tumor marker, CRTC1, MAML2, gene fusion, and FISH.[8–13] These would provide a better comprehensive understanding of the pathogenesis and management

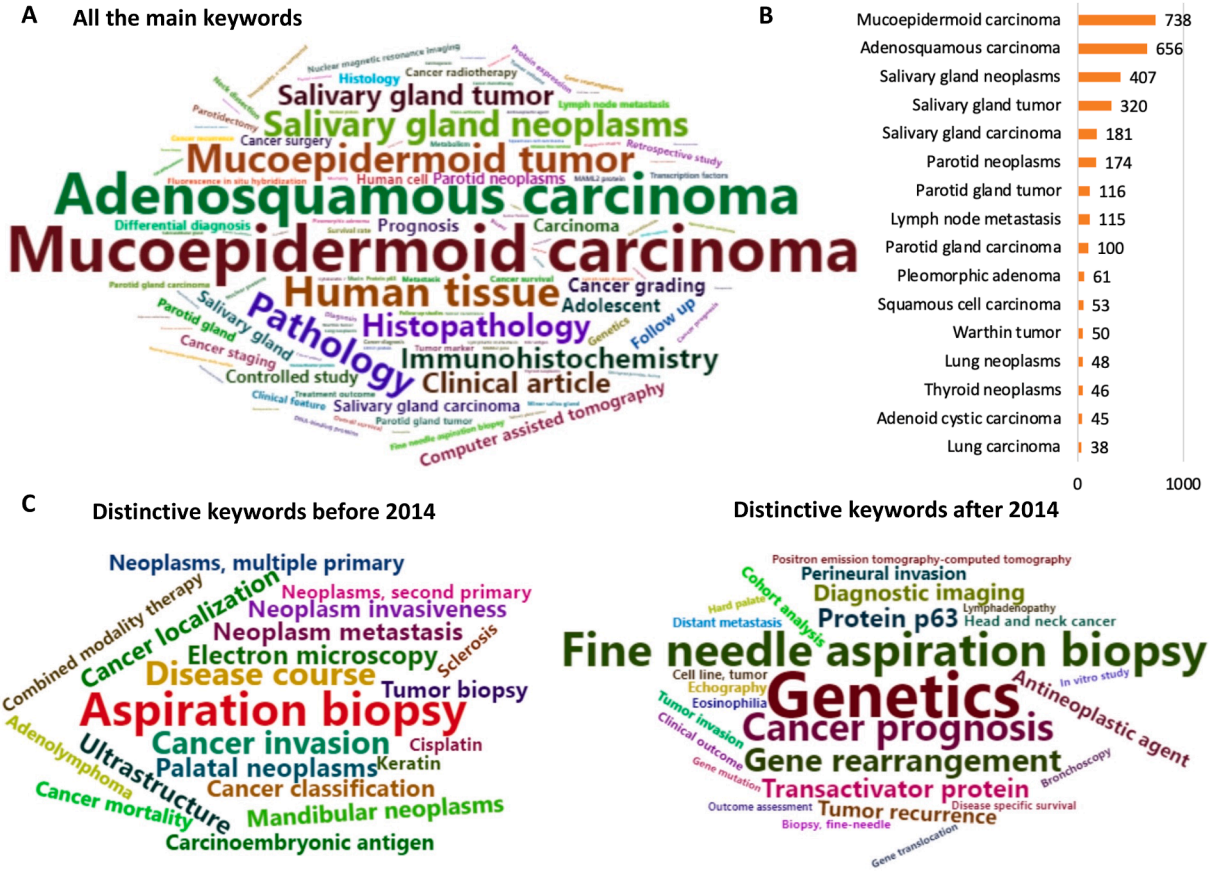

Figure 2 Research characteristics of the papers on salivary mucoepidermoid carcinoma (MEC). (**A**) Cloud graph of all the main keywords. (**B**) The keywords of differential diagnosis. (**C**) Cloud graphs of the distinctive keywords of papers published before 2014 and after 2014. The font size indicates the number of papers; a larger size means more papers in the cloud graphs.

strategies of this carcinoma. Also, we found that the increasing trend in the citations of international publications indicates that the field of MEC is a promising field, which continues to attract the attention of international investigators. The number of papers in the last decade was approximately equal to that before 2014, indicating that MEC research is undergoing a rapid developmental stage. Bibliometric characteristics of papers on MEC including journals of publications, contributing authors, institutions and countries of origin were identified in sequence. These would aid clinicians and investigators in choosing target journals, finding potential collaborators or partner institutions, as well as promoting mutual understanding and more reciprocal cooperation regarding MEC research.

In this study, we observed that the research trend of has changed to cohort analysis, clinical outcome, cancer prognosis, diagnostic imaging, PET-CT, perineural invasion, p63 protein, gene mutation, gene rearrangement, and gene translocation after 2014. The presence of the *MAML2* gene rearrangement and/or *CRTC1::MAML2* gene fusion resulting from the translocation t (11; 19) (q21; p13) have been observed in up to 80 % of MEC cases, especially classic, Warthin-like, and sclerosing subtypes.[2–4] Also, MEC patients with *MAML2* positivity usually showed relatively favorable prognosis.[3,4] Due to the low incidence of salivary MEC, the molecular signature of this carcinoma has not been well studied, making it difficult to evaluate new therapeutic approaches.[3,4] The use of immunohistochemical and molecular markers can complement information on cancer behavior and aggressiveness,[14–19] which may benefit the indication of targeted therapeutic approaches. Regarding the limitations of the current study, we only searched all the English papers from the Scopus database and thus may overlook important research published in other languages and other databases. Moreover, the more recent papers could not accumulate a large number of citations at the time of this study.

In summary, this scientometric study for the first time elucidated the current scenario and research trends in the field of salivary MEC. Molecular analysis is essential to improve the diagnostic differentiation of the salivary gland tumors and to identify novel biomarkers and potential targets for personalized therapies. Overall, finding the scientometrics would elucidate the comprehensive identification and recognition of the important research topics concerned, and help in improving in reciprocal collaboration and communication for investigations on this carcinoma.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jds.2025.07.027.

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